



**VISUAL LATCHING INDICATOR ARRANGEMENT
FOR AN ELECTRICAL BUSHING AND TERMINATOR**

Related Invention

INS A1
5 This is a Continuation-in-Part of Application
Serial No. 08/038,335 filed March 19, 1993, now abandoned.

Background of the Invention

10 The present invention relates to the
interconnection of electrical distribution elements and,
in particular, to the interconnection between a loadbreak
elbow terminator and a bushing.

15 Electrical distribution equipment, such as a
deadfront switch gear arrangement, typically includes
fixed electrical bushings which are to be connected to
external electrical cables. The fixed bushings are
mounted in a wall of the electrical equipment and have
their outer ends arranged to be connected to the cables.

20 One way of achieving this connection is by
inserting an elbow terminator onto the bushing, the
terminator being coupled to the cable. The elbow
terminator, which typically comprises a tapered socket
in which an electrical probe is mounted, is intended to
be inserted onto the fixed bushing such that a tapered
tongue of the bushing enters the socket. In so doing,
a conductive tube disposed within the tongue makes
25 electrical connection with the probe, thereby connecting
the cable to the fixed bushing.

30 The elbow terminator is secured to the bushing by
means of a latching ring disposed at an inner end of the
socket. That latching ring snaps into an annular latching
groove formed in the outer periphery of the leading end of
the tongue when the elbow terminator is pushed onto the
fixed bushing.

The elbow terminator is maneuvered onto the bushing by means of a hand-held shotgun stick which grabs a hook eye affixed to the elbow terminator. It may occur, however, that the tongue does not completely enter the socket, whereby the latching ring does not tightly grip the latching socket. That unlatched condition, which is potentially dangerous, is difficult for the operator to visually detect, especially since the operator will likely be standing remotely (e.g., at least three to five feet) from the terminator and bushing, for safety reasons.

It would therefore be desirable to facilitate the ability of the operator to detect an unlatched condition, especially when standing remotely of the terminator and bushing.

Summary of the Invention

The present invention relates to the combination of an electrical terminator and an electrical bushing component. The terminator includes a socket, and the bushing component includes a tongue receivable in the socket to electrically interconnect the terminator and bushing. The tongue and socket include a latching arrangement for positively latching the bushing component and terminator together when the tongue enters the socket to a prescribed depth. First and second visual indicators are disposed on outer peripheries of the bushing component and the terminator, respectively. The first and second visual indicators are arranged so that when the terminator is longitudinally inserted onto the bushing, the first and second indicators longitudinally approach one another sufficiently to at least become radially aligned with one another in order to provide a visual indication of positive latching. One of the first and second indicators

is situated radially outside of the other of the indicator and is visible when the combination is viewed in a radially inward direction passing through the one indicator.

5 In another aspect of the invention, an indicator is defined by a color band formed on one of the terminator and bushing component (preferably on the bushing component) and is arranged to be radially covered by an indicator in the form of a covering portion of the other
10 of the terminator and bushing component (preferably the terminator) when the tongue enters the socket to the prescribed depth, thereby providing a visual indication of positive latching.

The present invention also relates to an
15 electrical bushing component which possesses the color band, and also to a method of connecting an electrical terminator to an electrical bushing component which involves causing the color band to be covered when positive latching occurs.

20 **Brief Description of the Drawings**

The objects and advantages of the invention will become apparent from the following detailed description of a preferred embodiment thereof in connection with the accompanying drawings in which like numerals designate
25 like elements and in which:

FIG. 1 is a side elevational view of an elbow terminator and a bushing according to a first preferred embodiment of the invention, in a separated condition, and with the elbow terminator depicted in vertical section;

30 FIG. 2 is a view similar to FIG. 1 after the terminator has been inserted onto the bushing, a portion of the terminator being broken away;

FIG. 3 is a longitudinal sectional view taken through the bushing depicted in FIG. 1;

FIG. 4 is a plan view the terminator and bushing after they have been joined together;

5 FIG. 5 is a side elevational view of an elbow terminator and a bushing according to a second embodiment of the invention, in a separated condition, and with the elbow terminator partially broken away; and

10 FIG. 6 is a view similar to FIG. 5 of the second embodiment, after the terminator has been inserted onto the bushing.

Detailed Description of Preferred Embodiments of the Invention

15 Depicted in FIG. 1 is a loadbreak elbow terminator 10 and a bushing 12 adapted for connection therewith. The bushing can be of a type which is fixed to a stationary panel such that a tongue 22 is externally exposed. The elbow terminator includes a socket 14 formed in an electrical insulative material 16. The socket 14
20 includes a tapered portion 13 and merges into a cylindrical portion 15. Extending centrally along the socket is a probe 18 which carries an arc follower 20. The probe 18 is electrically connected to a cable 19.

25 The tongue 22 is configured to make an interference fit within the socket 14. Adjoining the tongue 22 is a cylindrical enlargement 24 configured to enter the ^{cylindrical} socket portion 15. The tongue 22 is hollow and includes a contact tube 26 (see FIG. 3) in which are disposed an arc interrupter 28 and a contact sleeve 30.

An end of the tongue 22 includes a latching groove 32. When the elbow terminator is pushed onto the bushing 12, the latching groove 32 receives, by snap fit, a latching ring 34 formed on a semiconducting insert 35 at an inner end of the socket 14. In that fashion, the bushing becomes secured to the elbow terminator.

As thus far described, the elbow terminator 10 and bushing 12 are conventional. The elbow terminator is maneuvered onto the bushing 12 by a conventional shotgun stick (not shown) which is manipulated manually by an operator. The shotgun stick includes a hook which grips a hook eye 38 carried by the elbow terminator. As explained earlier, it may occur that the tongue does not fully enter the socket, so that the latching ring 34 does not completely enter the latching groove 32. In that event, the bushing could become dislodged from the elbow terminator 10.

That problem is avoided by the present invention which involves the addition of a visual indicating arrangement which visually indicates when the tongue has entered the socket to a sufficient longitudinal depth to ensure latching. The visual indicating arrangement comprises cooperative visual indicators positioned on the bushing and elbow terminator such that the locations of the visual indicators relative to one another in the longitudinal direction is readily visible to the operator. When the visual indicators attain a certain longitudinal relationship, it is ensured that positive latching has occurred. The edge 56 is visible when the bushing 12 is viewed in a radially inward direction D passing through the edge 56, as is evident from FIGS. 3 and 4.

The visual indicators comprise an indicator gauge 40 disposed exteriorly on the bushing 12, and an indicator ring 42 disposed exteriorly on the elbow terminator 10. The indicator ring 42 encircles the outer periphery of the elbow terminal at the entrance to the ~~Access 15~~ ^{cylindrical portion} and forms a shoulder 44 which defines a mark in the form of an annular edge indicator or witness line 46.

The indicator gauge 40 includes an annular base portion 48 which encircles the outer periphery of the busing at a location remote from the leading end thereof, i.e., remote from the latching groove 32 for the preferred version.

Projecting radially inwardly from an inner diameter of the base portion 48 is an annular ridge 50 configured to snap into a corresponding annular depression formed in the bushing. The semiconductive ground shield 52 could be modified to provide an appropriate surface in which the annular depression can be formed. Alternatively, the semiconductive ground shield 52 could be modified to include the spaced tabs 54 as an integral, i.e., one-piece, part.

Projecting longitudinally from the base 48 is a plurality of circumferentially spaced tabs 54. Each tab 54 includes a beveled free end 55 which defines a mark in the form of a circumferentially extending indicator edge 56 at a radially inner portion of that free end 55. The tabs 54 are of a prescribed length so that when the tongue 22 enters the socket 14 to a longitudinal depth sufficient to ensure positive latching by the latching ring 34 and latching groove 32, the indicator edges 46, 56 will either be radially aligned with one another (as shown in FIG. 4) or pass one another (i.e., the indicator edges 56 would be disposed to the left of the indicator edge 46 in FIG. 4). Thus, an operator can tell, merely

by a visual inspection of the relative longitudinal locations of the edges 56, 46 whether positive latching has occurred.

5 The beveling of the free ends 55 of the tabs makes it easier for the operator to observe the indicator edges 56. By forming the tabs 54 on an annular base 48, the tabs can be conveniently mounted as a unit on the bushing. It will be understood by those skilled in the art that, depending upon the configuration of the outer
10 periphery of the bushing, it may be possible to mold the bushing with tabs in lieu of providing a snap-on base 48 to which the tabs are mounted.

It may also be desirable to reverse the parts, i.e., to provide the gauge tabs 54 on the terminator and
15 provide the indicator ring 42 on the bushing.

The indicator ring 42 could comprise an integral, one-piece portion of the terminator housing, or a separately attached piece.

It may be desirable to color the gauge tabs 54
20 differently from the indicator ring 42 in order to contrast the edges 46, 56 as much as possible and thereby, facilitate a proper observation by the operator.

While in the disclosed preferred embodiment the indicator gauge 40 is disposed on a bushing, it will be
25 appreciated that the indicator gauge could also be disposed on a bushing insert which is to be mounted to a bushing. Bushings (such as, for example, LBC devices, standoffs, and one-piece bushings) and bushing inserts can be generically referred to as "bushing components".

30 A second embodiment of the invention, depicted in FIGS. 5 and 6, involves a loadbreak elbow terminator 100 and a bushing 112, wherein a visual indicator or mark 114 is provided on the bushing to cooperate with a visual indicator 116 provided on the terminator.

The visual indicator 116 on the terminator is defined by an end portion or end flange of the terminator which surrounds the cylindrical portion 115 of the terminator socket ^{into} ~~into~~ which a tongue 118 of the bushing is to be inserted.

The visual indicator 114 on the bushing is in the form of an annular color band of width W ^{directly} ~~formed~~ on the outer surface of the tongue ¹¹⁸ ~~110~~ of the bushing. The color of the band 114 sharply contrasts with that of an adjacent portion 120 of the tongue 118 and also with that of the outer surface of the flange 116. Preferably, the band color is of a highly visible nature, such as a bright dayglow color like yellow, orange, lime green, etc., which is readily visible from at least a three to five foot distance. The color of an adjacent portion of the tongue would be formed of a contrastingly dark color such as brown or gray.

The band 114 forms an edge indicator or witness line 122 at its junction with the adjacent portion 120 of the tongue. Likewise, the end flange 116 of the terminator defines an edge indicator 124.

The relationship between the edge indicators 122, 124 is such that when the terminator is longitudinally inserted onto the bushing sufficiently far for positive latching to occur in the manner described earlier herein, the edge indicators 122, 124 will have longitudinally approached one another sufficiently to be at least radially aligned with one another. That is, when positive latching has occurred, the color band 114 will be completely disposed within the socket portion 115 and no longer visible.

That indication will be discernable by an operator who views the bushing in a radial direction (i.e., radially with reference to the longitudinal axis thereof), from a distance of at least three to five feet.

5 This enables the operator to maintain a safety distance while determining that latching has occurred.

The color band 114 can be applied in any suitable manner, preferably by applying a colored ink by means of a roller traveling around the outer periphery of the tongue.

10 The band 114 is preferably circumferentially continuous, but it could be interrupted as well, since it is only required that the band be at least partly visible when there is no positive latching, and be invisible when there is positive latching.

15 Although the present invention has been described in connection with preferred embodiments thereof, it will be appreciated by those skilled in the art that additions, deletions, modification, and substitutions not specifically described may be made without departing from the spirit and scope of the invention as defined in the

20 appended claims.